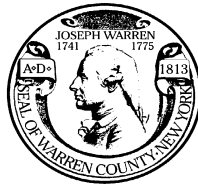


WARREN COUNTY ROAD CONDITIONS 2016

WARREN COUNTY DEPARTMENT OF PUBLIC WORKS



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TABLE OF CONTENTS

1. EXECUTIVE SUMMARY	1
2. STUDY BACKGROUND	2
2.1 Road Evaluation Methodology.....	2
2.2 Roadway Network.....	2
3. EXISTING ROAD CONDITIONS.....	4
3.1 County Overview	4
3.2 Road Conditions in the Municipal Subdivisions.....	6
3.3 Road Conditions: 2013-2016	8
4. ROAD LIFE CYCLE	10
5. ROAD PRESERVATION PLAN	11
5.1 Road Condition Strategies and Goals	11
5.2 Funding Level Estimates.....	11
5.3 Estimated Service Life and Repair Costs.....	13
5.4 Service Life-Miles.....	15
6. CONCLUSION.....	15

1. EXECUTIVE SUMMARY

The Warren County Department of Public Works (DPW) is responsible for maintaining safe operating conditions of the County-owned transportation network. Although the County system includes many modes of transport, the highway network, with approximately 247 miles of paved roads requires the largest investment in terms of labor, materials and equipment.

In order to assure the welfare of the traveling public, DPW engineers and highway crews constantly monitor and maintain the many elements of the transportation system. However, the primary focus of the DPW highway monitoring and maintenance activities is the roadway surface. Because of the significant cost, limited functional life expectancy and direct effect on safe vehicle operations, the road surface is arguably the most important component of the travel network.

During the summer of 2016, the DPW engineering staff again conducted road evaluations of the entire County roadway system using visual inspection methods in accordance with the New York State Department of Transportation (NYSDOT) guidelines. This report details the existing surface conditions and conditions of county routes anticipated to have improvements completed in 2016, provides a comparison of 2016 conditions with the previous years' conditions (2013-2015), the proposed rehabilitation/reconstruction programs based on the findings, and discusses various road maintenance strategies and associated costs.

A review of current conditions indicates that current (2016 budget year) funding levels (2.3 million) for road rehabilitation and maintenance have maintained good road conditions and improved roads in poor condition compared to 2015 conditions. To continue to make progress toward established DPW goals comparable or greater funding will be needed in the 2017 budget year.

2. STUDY BACKGROUND

2.1 Road Evaluation Methodology

DPW engineering staff conducted road surface evaluations for the entire County system in accordance with the NYSDOT visual assessment guidelines. Surface condition ratings were determined based on the visual inspections of pavement distress in the form of scaling, cracking, settlements and heaves, wheel path rutting, and raveling. The ratings scale ranges from one to ten, where one (1) represents an impassable condition and ten (10) represents a “like new” condition. The surface ratings can be categorized from Excellent to Poor using the following correlation:

- Excellent- surface rating of 10
- Good- surface rating of 8 or 9
- Fair- surface rating of 6 or 7
- Poor- surface rating of 5 or below

Typically, pavement surfaces with condition ratings of six (6) or above are considered satisfactory requiring routine annual maintenance activities to prolong service life. Surface ratings of five (5) or four (4) indicate the road is significantly distressed and in need of rehabilitation. Rating of three (3) or less are designated to roadways with severely deteriorated surface conditions that may pose a risk to motorists. Roads in this condition will likely require full-depth reconstruction. Table 1 shows the road surface ratings based on distress frequency and severity that were used in the evaluations.

As a supplement to the criteria detailed in Table 2-1, DPW engineers used photographic scales in the field. The photographic scales depict several roadway surfaces for each rating point and aid engineers to determine the appropriate surface rating objectively. The photographic scales along with a matrix developed by NYSDOT for determination of surface condition rating were used to assign surface condition ratings to county roads.

2.2 Roadway Network

The County-owned network of roadways consists of 246.09 miles (501.85 lane miles) of bituminous asphalt pavement and 0.81 miles (1.62 lane miles) of concrete pavement. Table 2-2 shows the total miles of County-owned roads by municipal subdivisions.

Table 2-1
Surface Rating Based on Frequency and Severity Descriptions

Frequency		Severity								
		None	Slight	Minor	Moderate	Moderate to Severe	Severe	Very Severe	Travel is Impaired	Impassable
No distress is present. A single random defect per 0.10 mile is allowed.	None	10 / 9	9	-	-	-	-	-	-	-
Most of the pavement is free of distress. One or two cracks or distresses are visible for the next 0.10 mile.	Infrequent	-	8	8	8	7	7	-	-	-
Much of the pavement is free of cracking. Large blocks of distress-free pavement are present.	Infrequent to Occasional	-	8	7	7	7	6	6	-	-
Much (< 1/2) to most (> 1/2) of the pavement is cracked. Uncracked or undistressed blocks of pavement range from 20-30 ft per lane to 12 ft per lane.	Occasional to Frequent	-	7	7	6	6	5	5	-	-
Nearly all of the pavement is cracked. Uncracked or undistressed blocks of pavement are 12 ft square or less.	Frequent	-	7	6	6	5	4	3	2	1
Mostly cracked. Cracks or distress are continuous and spaced only a few feet apart.	Very Frequent	-	6	6	5	5	4	3	2	1

Slight	Cracks are tight, single and only a few feet long. Tight, single longitudinal cracks, partial or continuous, are included.
Minor	Cracks are generally < 1/8 inch wide, some with minor secondary cracks, no or few connected cracks. May have a few small spalls (< 1 ft square)
Moderate	Cracks are generally > 1/8 inch wide; secondary cracking is common, some cracks connected; may have some minor popouts or small (1-2 ft) to medium (3-4 ft) patching.
Moderate to Severe	Distresses vary from "Moderate" to "Severe"
Severe	Cracks are wide and/or have extensive interconnected secondary cracking; holes, loose material and/or patching are common, patches may have patches.
Very Severe	Cracks are wide, holes and/or patching is extensive; patches extend across the full lane or extend several feet along the lane; patches on patches are common.
Travel is Impaired	Holes in pavement are large and/or pavement has so many layers of patches that the section can be traveled only at reduced speed.
Impassable	Travel by ordinary car would risk damage to vehicle

**Table 2-2
Miles of County Road per Municipality**

Municipality	Total Centerline Miles of County Road	Total Lane Miles of County Road
Town of Bolton	22.34	44.68
Town of Chester	30.87	61.47
Town of Hague	9.02	18.04
Town of Horicon	26.17	52.34
Town of Johnsburg	24.47	48.94
Town of Lake George	7.95	15.90
Town of Lake Luzerne	14.88	29.76
Town of Queensbury	39.17	86.83
Town of Stony Creek	21.72	43.44
Town of Thurman	26.53	53.06
Town of Warrensburg	23.19	46.38
Village of Lake George	0.59	2.36
	246.90	503.47

3. EXISTING ROAD CONDITIONS

DPW engineers resumed road surface evaluations in 2011 and have conducted them annually since. Many county roads have undergone rehabilitation or reconstruction since the original evaluation was conducted. The information contained in this report represents current condition assessments of the roadways and the ratings presented reflect anticipated 2016 road conditions at the end of construction season.

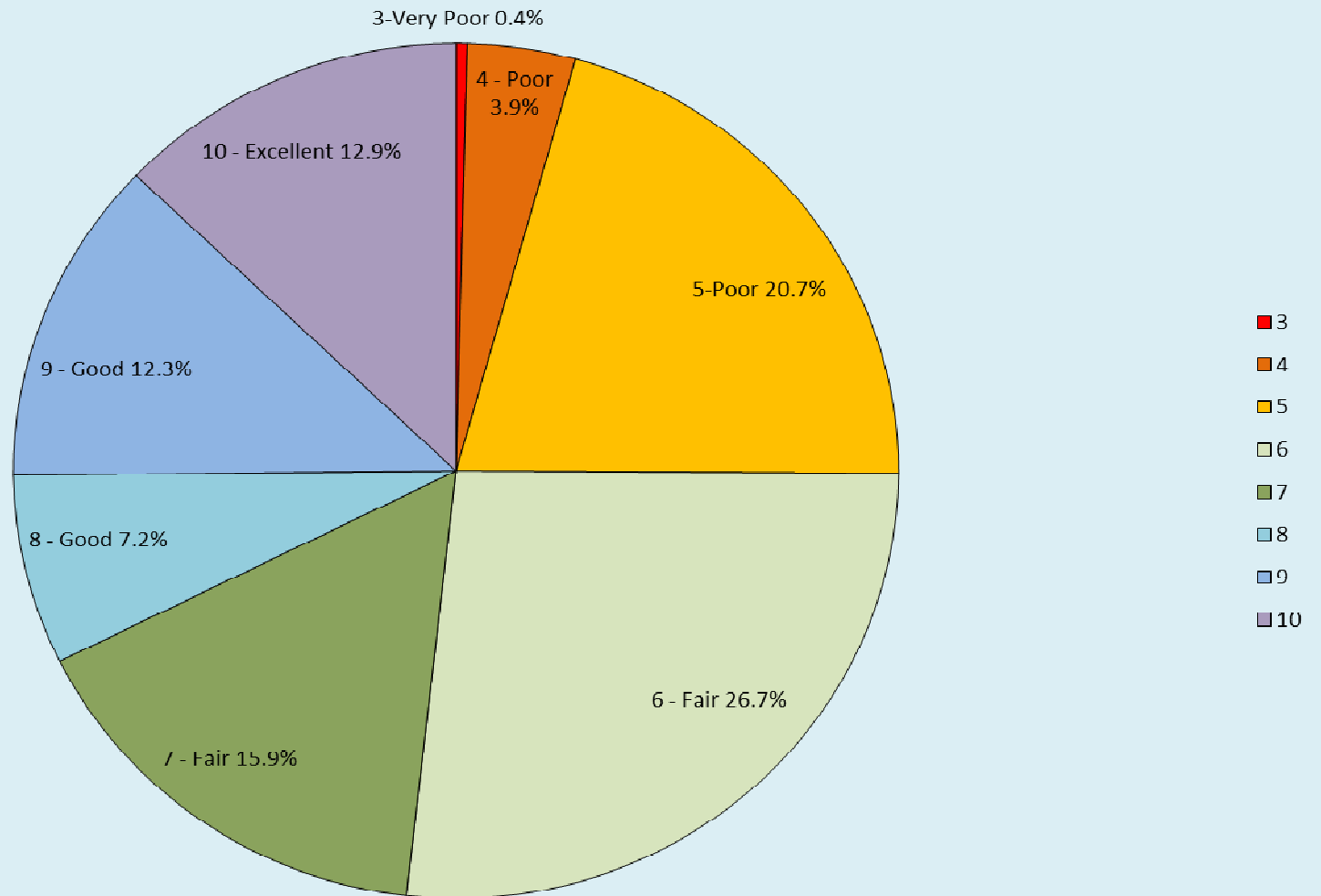
3.1 County Overview

Based on the findings from the 2016 county road evaluations, the following conditions were found:

- 0.4% of county roadways are in “Very Poor” Condition.
- County roadways with “Fair” surface conditions represent 42.6% of county road miles.
- Approximately 24.6% of county roadways have “Poor” surface conditions.
- The remaining 32.4% of county roadways have “Good” or “Excellent” surface conditions

Figure 3-1 illustrates the road surface rating of county roads by percentage of total road miles.

Figure 3-1
2016 Warren County Road Conditions



3.2 Road Conditions in the Municipal Subdivisions

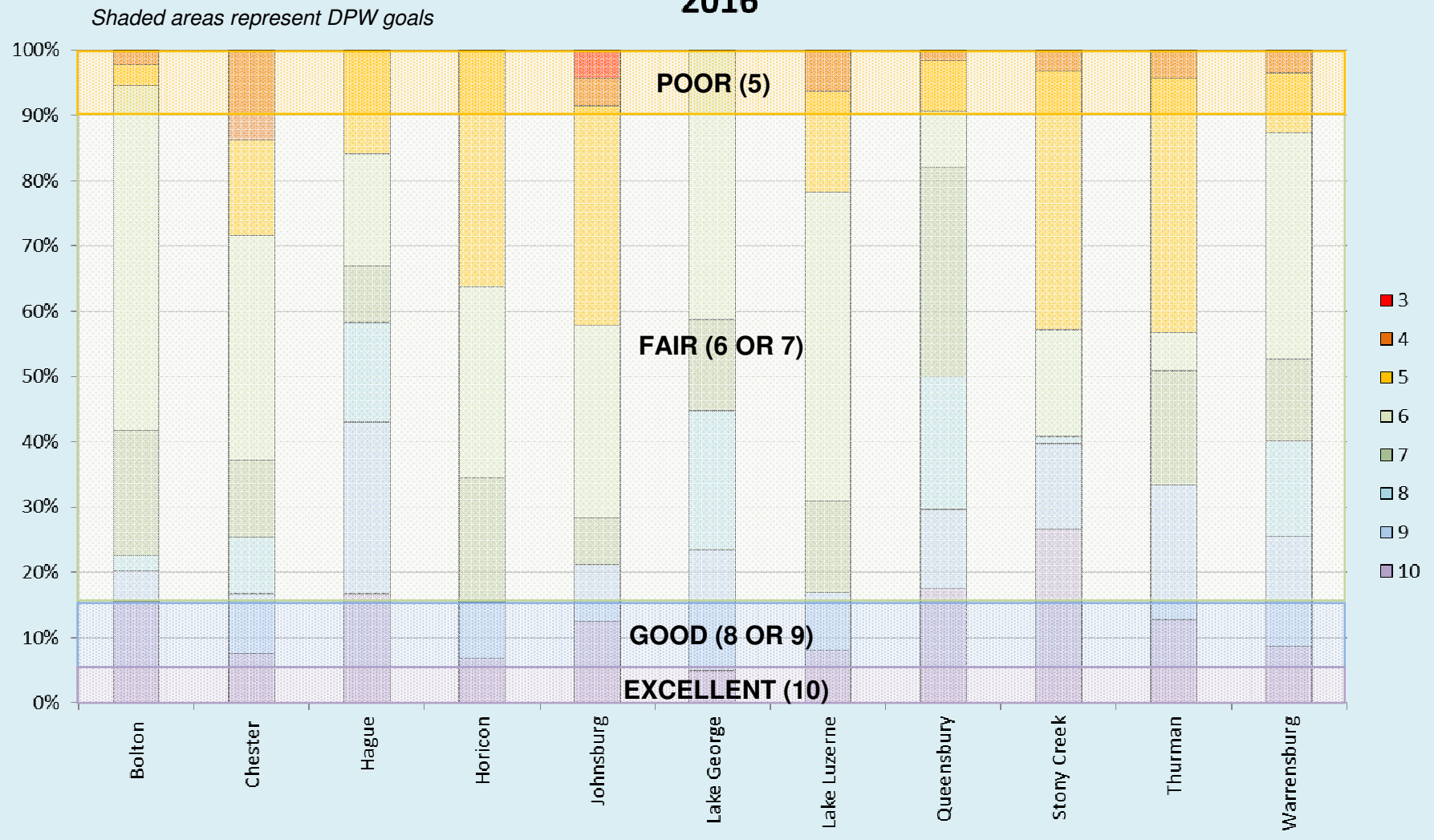
The county roadways 2016 conditions were also analyzed based on condition rating by percentage within the municipal subdivisions. Johnsbury is the only town having county roads within its borders at condition rating 3, or Very Poor condition. All the towns, with the exception of Lake George, Hague and Horicon have a small percentage of roads (13% or less) at condition rating 4, or Poor condition. The Towns of Thurman, Stony Creek and Johnsbury have the largest percentage (40+%) of county roadways considered to be in Poor condition (rating of 5 or less), with the Town of the next largest at 36%.

The Towns of Bolton, Lake George and Queensbury represent the municipalities with most of their county roads (91-100%) in Fair or better condition. The Towns of Lake Luzerne, Hague and Warrensburg have a large percentage (78-87%) of county roads in Fair or better condition. The remaining towns have over 50% of their county roads in Fair or better condition.

Figure 3-2 illustrates 2016 road conditions by municipal subdivision.

Comparisons of 2013-2016 road condition data by township is found in the appendix.

Figure 3-2
Warren County Road Conditions
2016



3.3 Road Conditions: 2013-2016

A review of previous year's road conditions was conducted to compare current conditions and determine condition trends and rate of improvement and/or deterioration of county roads. Based on this review, Table 3 was developed and represents the miles of county roads based on rating category recorded for the last three years.

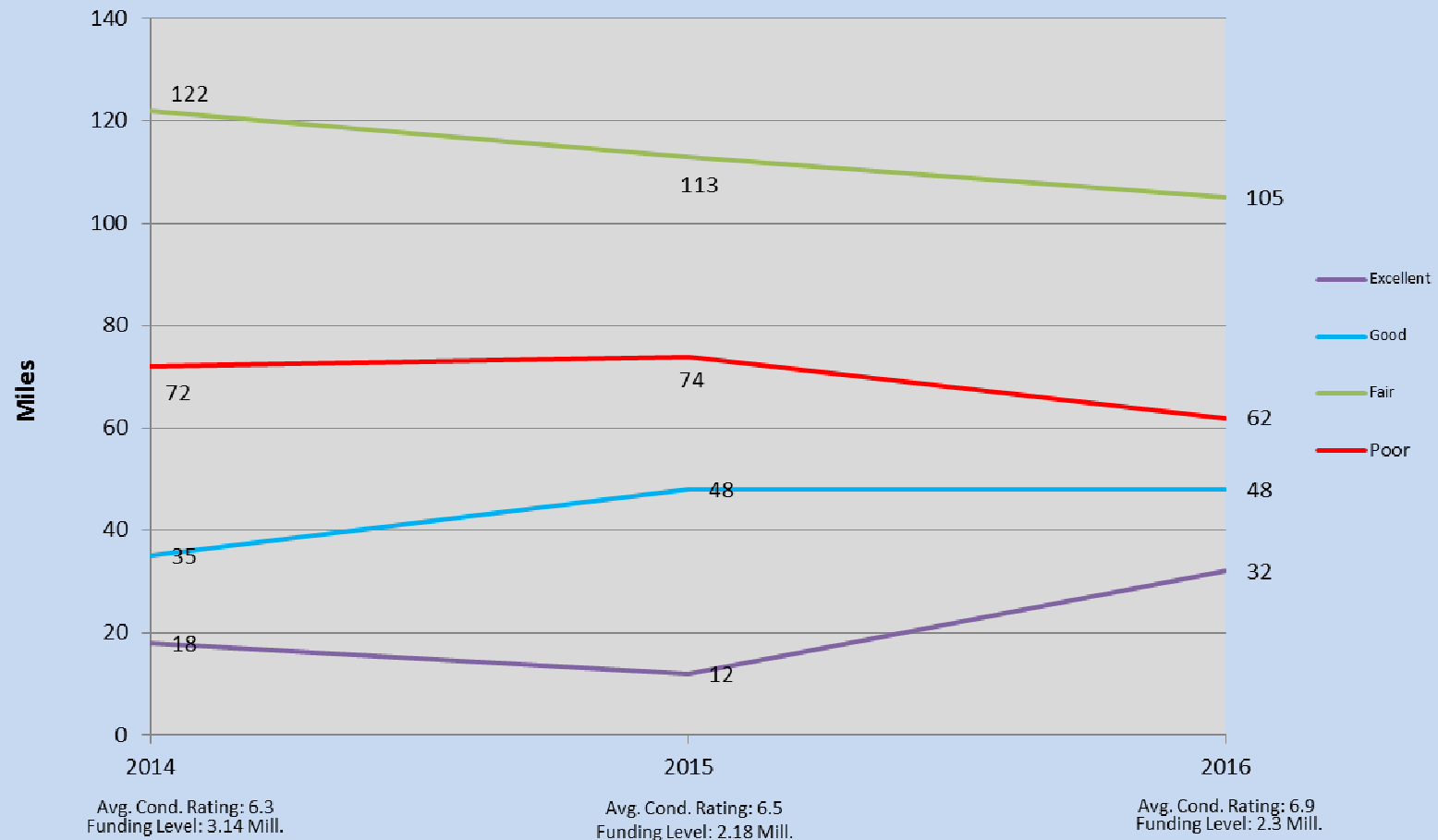
Table 3-1 County Road Condition Trends: 2014-2016			
Rating Category	2014	2015	2016
Excellent	18 miles	12 miles	32 miles
Good	35 miles	48 miles	48 miles
Fair	122 miles	113 miles	105 miles
Poor	72 miles	74 miles	62 miles

As shown in Table 3-1, the trend for county roads indicates a gain (20 miles) for roads in Good or better condition and a loss (12 miles) in roads in Poor condition from 2015 to 2016. Roads in Fair condition experienced a drop (8 miles) from 2015 conditions. There is no change in roads with Good surface condition. It is noted that the 2016 condition ratings included sections of roads anticipated to be completed within the year as having an Excellent surface condition.

A comparison to 2014 and 2015 conditions indicates a continued rebound in overall road surface conditions in 2016. This is attributable to several road sections that were in Fair or Poor condition being reconstructed resulting in an Excellent surface condition and also increased funding at the end of 2015 budget year that was not reflected in 2015 conditions at time of report. The status of roads in Good condition is attributable to the DPW preventative maintenance strategy keeping these roads from degrading too rapidly.

Figure 3-3 provides a graphical representation of county road conditions from 2014 to 2016.

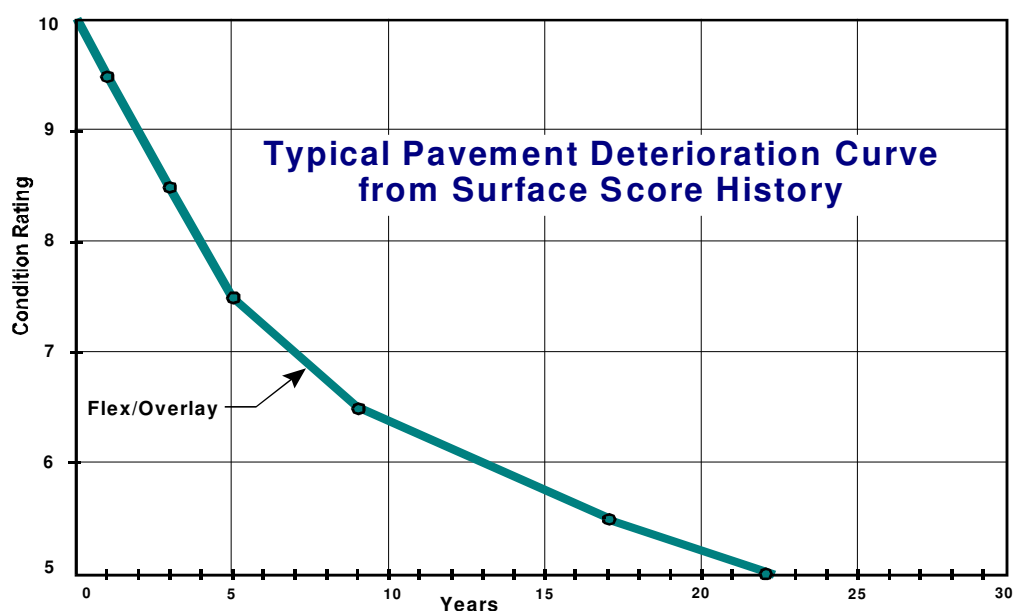
FIGURE 3-3: 2014-2016 ROAD CONDITIONS



4. ROAD LIFE CYCLE

The road surface life cycle of an existing road, or period of time that a newly-paved road (surface rating 10) deteriorates to a condition requiring rehabilitation (surface rating 5 or below), is typically measured in decades, or years, depending on the level of rehabilitation (full reconstruction vs. overlay) and various factors such as weather conditions, subsurface soil type, drainage and preventative maintenance. Figure 3 is a graphic representation of flexible/overlaid pavement (asphalt) depicts the typical life cycle of asphalt pavement surface. The detailed presentation developed by NYSDOT on road life cycle and repair costs is provided in Appendix C.

Table 4-1: Road Surface Life Cycle



Source: NYSDOT

As shown in Figure 4, typically an asphalt-paved surface will experience a significant loss to surface rating in the first 5 years. This is usually attributed to a lack of preventative maintenance, such as crack filling or patching, or other factors such as poor compaction or subsurface soil type. In 10 years, the typical road surface will fall below the 7 surface rating. Some type of rehabilitation, such as an overlay or intermittent milling and replacement, will be needed to regain a Good condition rating. Roads falling to a surface rating of 5 or less (20+ years) will require significant rehabilitation or reconstruction to regain a Good condition rating.

5. ROAD PRESERVATION PLAN

5.1 Road Condition Strategies and Goals

Several road preservation strategies were considered when developing a preservation plan for Warren County roads. Attempting to repair only roads in Poor condition, or a “Worst First” strategy, will result in repair of only small portions of these roadways due to resource and budgetary constraints, while roads in Good or Fair condition deteriorate to Fair or Poor condition. NYSDOT has developed a maintenance strategy that focuses on preventing road conditions falling below the Good threshold as a priority while developing long-term strategies for roads in Fair or Poor condition.

A staged approach was chosen to be implemented in order to maintain existing conditions of roads in Fair to Good condition, while over a period of years rehabilitating and reconstructing roads in Poor condition with the most immediate need. Therefore, goals were established by DPW engineers for county roads in order to ensure Warren County road conditions are at a minimum maintained, and improved where necessary. The condition distributions recommended by NYSDOT were modified to account for County resources and budgetary constraints. The road condition goals set are the following:

- Surface Condition Rating of 10- 5% (currently 12.9%)*
- Surface Condition Rating of 8 or 9- 10% (currently 19.5%)
- Surface Condition Rating of 6 or 7- 75% (currently 42.6%)
- Surface Condition Rating of 5- 10% (currently 20.7%)
- Surface Condition Rating of 4 or below- 0% (currently 4.3%)

*includes 2016 anticipated projects

To achieve these goals, a road preservation plan was developed based on funding level estimates accounting for estimated service life (ESL), service life-miles (SLM) budgetary and staffing constraints.

5.2 Funding Level Estimates

Annual funding estimates were calculated by DPW engineers to achieve the condition rating goals established in a 5-year period, 10-year period, and to maintain existing conditions of county highways. Annual funding of 4.5-5.5 million dollars would achieve established goals in approximately five years. To reach established road condition goals in a 10-year period it was estimated that annual funding of 3.5-4.5 million dollars would be required. To maintain existing (2015) road surface conditions on county roadways it was determined that annual funding of 2.5-3.5 million dollars per year is required. A portion of annual funding would be provided through the federal *Consolidated Local Street and Highway Improvement Program* (CHIPs), which currently provides approximately 1.65 million dollars annually.

It should be noted that although average deterioration rates of roadways have been developed, it is difficult to predict the deterioration rate of a particular roadway surface

beyond five years. Environmental, geologic, construction and maintenance factors may significantly impact the anticipated service life of a roadway. Therefore, any required maintenance/repair and subsequent cost estimates beyond that point may change significantly.

Due to staffing reductions and a decline in available equipment in recent years as a result of budget constraints, estimates for county forces to perform work in each of the plans has been reduced. Estimates for the \$4.5-5.5 million/yr plan reflect a higher level of repairs made annually and most of the work would need to be privately contracted. Estimates for the \$3.5-4.5 million/yr plan reflect the use of county forces to perform approximately half of the work with the remainder of repairs/improvements privately contracted. The \$2.5-3.5 million/yr plan would have county forces doing most of the work with some being privately contracted.

It should be noted that the \$4.5-5.5 million/yr and the \$3.5-4.5 million/yr plans can be reduced to \$2.5-3.5 million/yr (2016 dollars) after their projected completion (5 and 10 years respectively). The stages of the plan are shown in Table 5-1.

Year	Action/Repairs	\$4.5-5.5 Mill/Yr Plan	\$3.5-4.5 Mill/Yr Plan	\$2.5-3.5 Mill/Yr Plan
1 (2016)	Reconstruct road sections with rating of 4 or less. Pavement rehab on road sections with rating of 5. PM ³ /paving on road sections with rating of 6. PM on road sections with rating of 7 or higher.	\$2.5 million \$1.5 million \$900,000 <u>\$600,000</u> \$5.5 million	\$1.5 million \$1.5 million \$900,000 <u>\$600,000</u> \$4.5 million	\$1.2 million \$600,000 \$400,000 <u>\$100,000</u> \$2.3 million ¹
2 (2017)	Reconstruct road sections with rating of 4 or less. Pavement rehab on road sections with rating of 5. PM/paving road sections with rating of 6. PM on road sections with rating of 7 or higher.	\$3 million \$1.5 million \$600,000 <u>\$400,000</u> \$5.5 million	\$2 million \$1.5 million \$600,000 <u>\$400,000</u> \$4.5 million	\$1.8 million \$1 million \$400,000 <u>\$100,000</u> \$3.3 million ²
3 (2018)	Reconstruct road sections with rating of 4 or less. Pavement rehab on road sections with rating of 5. PM/paving road sections with rating of 6. PM on road sections with rating of 7 or higher.	\$2.2 million \$1 million \$800,000 <u>\$700,000</u> \$4.7 million	\$1.7 million \$1 million \$600,000 <u>\$500,000</u> \$3.8 million	\$1.5 million \$1 million \$400,000 <u>\$200,000</u> \$3.1 million
4 (2019)	Reconstruct road sections with rating of 4 or less. Pavement rehab on road sections with rating of 5. PM/paving road sections with rating of 6. PM on road sections with rating of 7 or higher.	\$1 million \$1.7 million \$1 million <u>\$800,000</u> \$4.5 million	\$1 million \$1.5 million \$700,000 <u>\$500,000</u> \$3.7 million	\$1.4 million \$1 million \$400,000 <u>\$200,000</u> \$3.0 million
5 (2020)	Reconstruct road sections with rating of 4 or less. Pavement rehab on road sections with rating of 5. PM/paving road sections with rating of 6. PM on road sections with rating of 7 or higher.	\$1 million \$1.5 million \$1.3 million <u>\$700,000</u> \$4.5 million	\$1 million \$1 million \$800,000 <u>\$700,000</u> \$3.5 million	\$1.4 million \$1 million \$400,000 <u>\$200,000</u> \$3.0 million

Note: The Consolidated Local Street and Highway Improvement Program (CHIPs) funding is anticipated to be \$1.65 million annually for the next five years, but may fluctuate from year to year.

1. Adopted 2016 Budget
2. Proposed 2017 Budget
3. PM - Preventative Maintenance

5.3 Estimated Service Life and Repair Costs

Based on data from repairs completed on Warren County roads, the estimated service life of repairs have been developed. Estimated Service Life refers to the longevity of a repair made to a roadway before that repair will no longer be effective. For example, if a full-depth reclamation is performed, it is estimated that the repair will last for 20-25 years, or has an ESL of 20-25 years; while a roadway receiving a pavement overlay will have an ESL of 5-10 years before that repair is no longer effective, and a roadway receiving crack seal will have an ESL of 2-3 years, etc. Table 5-2 shows the type of repair needed, the estimated service life and the estimated cost per lineal mile of roadway.

Table 5-2 Estimated Service Life (ESL) and Repair Costs		
Type of Repair	ESL (Yrs.)	Cost/ Lineal Mile
Preventative Maintenance (crack seal, patching, etc.)	2 to 3	\$10,000- \$20,000
Restoration (overlay, fog seal, slurry seal, etc.)	5 to 10	\$50,000- \$150,000
Resurface (hot/cold partial reclaim, mill and fill, etc.)	10 to 20	\$150,000- \$250,000
Reconstruction (full-depth reclaim, rebase, culverts, etc.)	20 to 25	\$250,000- \$350,000

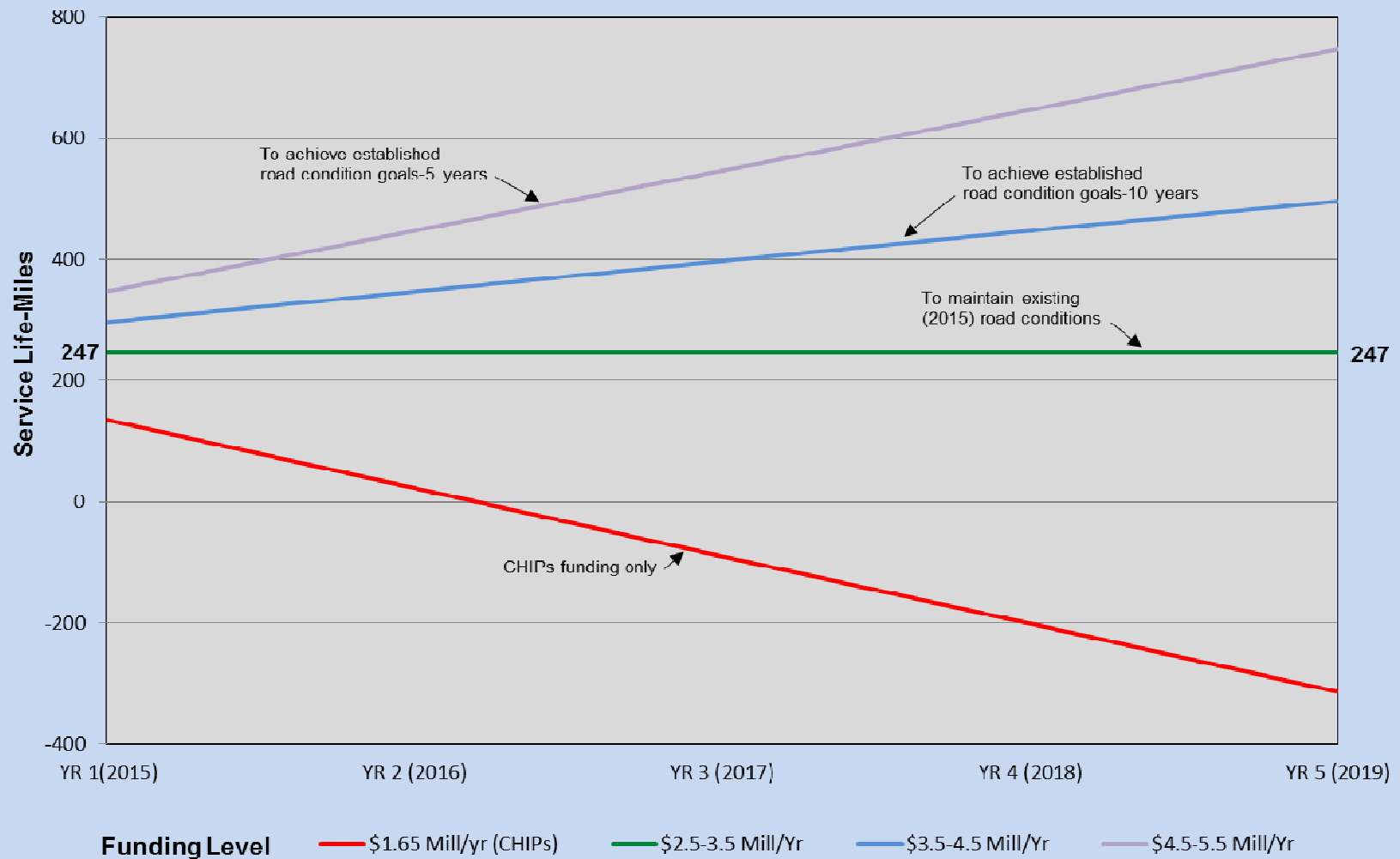
As shown in Table 5-2, the type of repair and estimated service life increase with a significant associated cost increase.

The current conditions of Warren County roadways were analyzed by DPW engineers to determine the average surface life. A weighted average was calculated based on miles of road with a specific surface condition rating and estimated service life at that rating. Based on this calculation, the following was determined:

- The average service life of county roads for the 2014 inventory was 10.0 years.
- The average service life for county roads for the 2015 inventory was 10.6 years.
- The latest (2016) road inventory indicates an average service life of 11.0 years.

The slight increase in service life compared to 2015 conditions is attributable to the inclusion of work anticipated to be completed this year will increase the amount of roads in Excellent condition. To achieve DPW established goals for road conditions, an average service life of 12 years is needed.

FIGURE 5-1: PROJECTED GAIN/LOSS IN SERVICE LIFE-MILES



5.4 Service Life-Miles

A unit of measure known as Service Life-Miles is also used as a way of gauging if maintenance efforts are keeping up with deterioration and meeting improvement goals for county roads. This unit is calculated using the ESL for the road surface and multiplying by the miles of roadway. Based on this calculation, DPW engineers have determined to maintain current (2016) conditions 247 SLM are required to be completed annually. To meet established goals (see Section 5.1) and slowly improve conditions on roadways over a 10-year period, it has been estimated that 300 SLM need to be completed annually. To meet established goals in approximately 5 years, it has been estimated that 350 SLM need to be completed annually. Figure 5-1 depicts projected gain/loss in service life-miles for county roads projected over 5 years based on various funding levels.

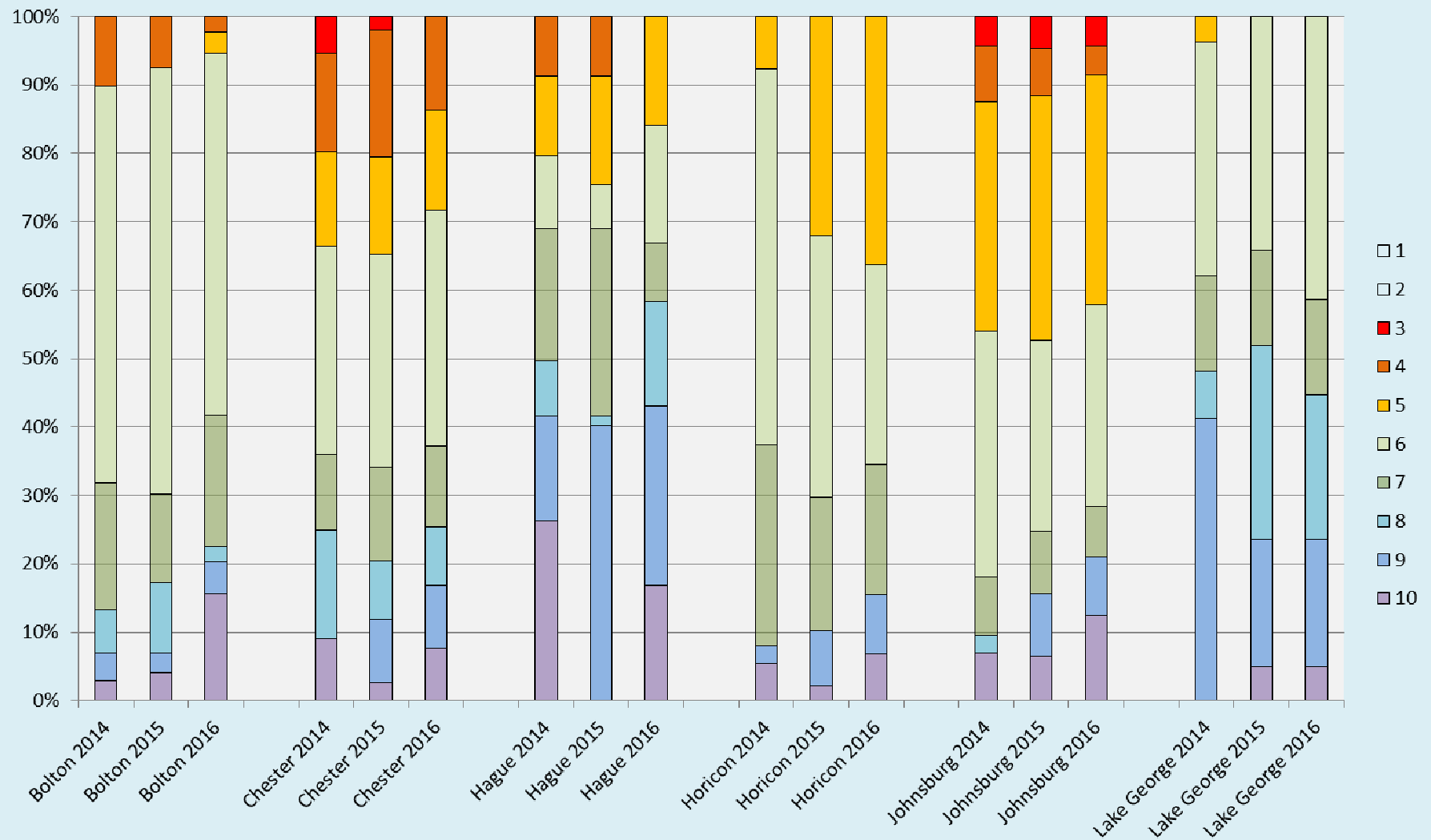
6. CONCLUSION

A review of existing road surface conditions indicates that many of Warren County roads are in need of some form of repair, with 25% of these roads in Poor condition. Annual funding (\$1.65 million) from the federal *Consolidated Local Street and Highway Improvement Program* (CHIPS) is not only insufficient to make necessary improvements; it is also insufficient to maintain existing conditions. Future funding would have to be greater than the 2016 budget to attempt maintaining existing conditions and slowly make progress toward established goals. The following page has a draft of the proposed 2017 county road budget providing 273 service life miles (SLM) at an approximate cost of \$3.3 million. As shown in the proposed budget, CHIPS funding will only yield 138 SLM, which is slightly more than half of what is needed to maintain existing conditions. To maintain existing conditions, an additional \$1.3 million (approx.) would be needed. To progress program goals and include an additional reconstruction project, another \$340,000 would be needed. To meet established goals for road conditions over 10-year period, annual funding of \$3.5-4.5 million would be necessary. To meet established goals for road conditions in a five-year period would cost \$4.5-5.5 million annually.

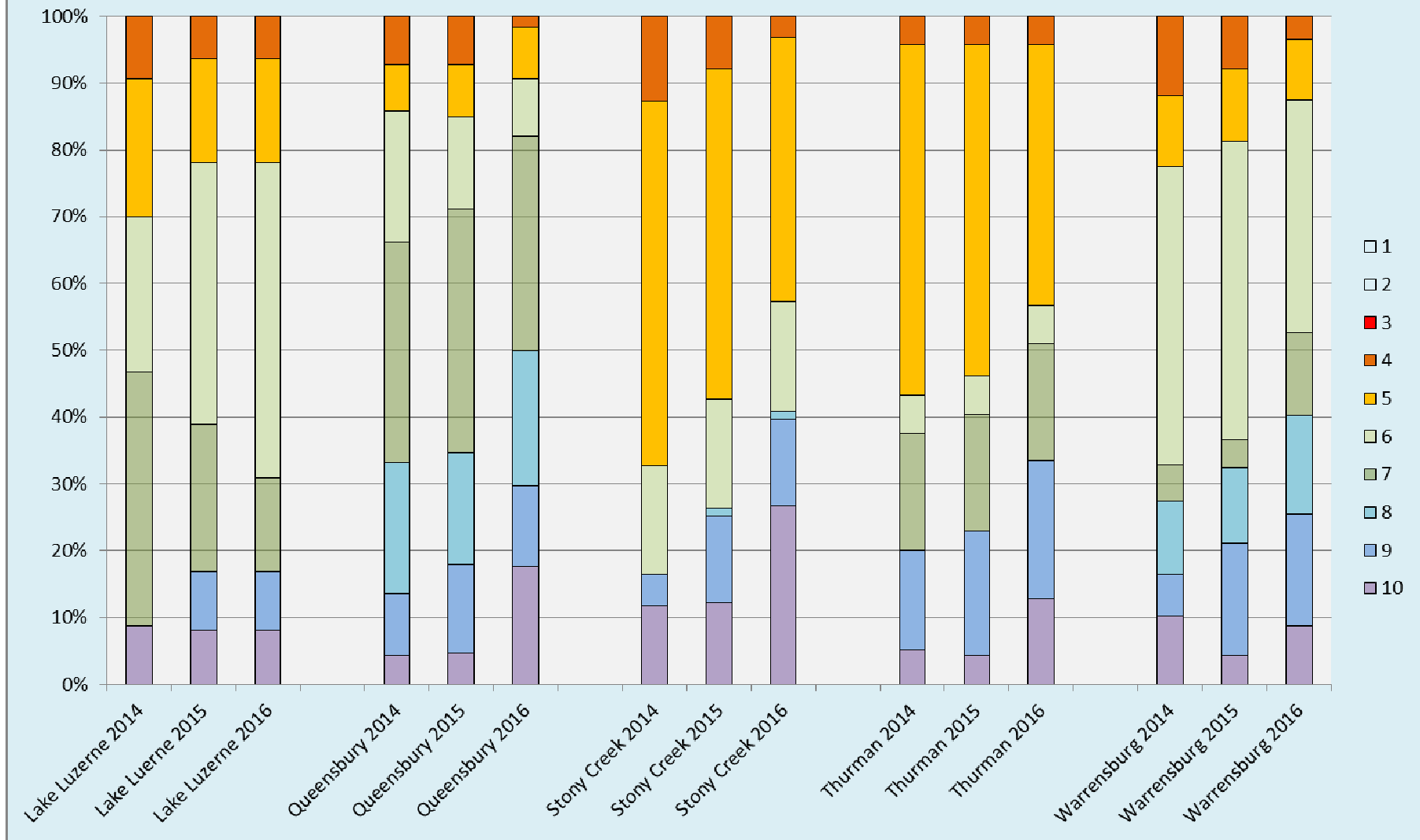
Appendix

DRAFT

2014-2016 Warren County Road Conditions by Town



2014-2016 Warren County Road Conditions by Town



**Warren County Department of Public Works
2017 Highway Projects**

DRAFT DATE: August 2016

Road	CR#	Town	From	To	Length of	Type of Repair	Cost	ESL Miles
East River Road	16	Lake Luzerne	2015 Construction	Call Street	1.20	Restoration (overlay)	\$ 126,000.00	8
Schroon River Road	10	Warrensburg	2016 Construction	1 mile North	1.00	Reconstruct/Resurface	\$ 188,000.00	22
Valentine Pond Road	55	Horicon	2016 Construction	north of Pease Hill Rd.	0.60	Reconstruct/Resurface	\$ 161,000.00	13
Garnet Lake Road	72	Johnsburg	2016 Construction	Hudson Street	0.60	Reconstruct/Resurface	\$ 165,000.00	13
Valley Road	36	Thurman	2016 Construction	Valley Rd. Bridge Rebate	0.75	Reconstruct/Resurface	\$ 195,000.00	17
Athol Road	4	Thurman	Cameron Rd.	2015 rebate at Firehouse	0.75	Reconstruct/Resurface	\$ 195,000.00	17
Harrisburg Road	22	Stony Creek	2016 Construction	Glass Brook Rd.	1.10	Restoration (overlay)	\$ 115,000.00	8
Schroon River Road	30	Chester	Route 8	.66 miles south	0.66	Reconstruct/Resurface	\$ 170,000.00	15
Warrensburg Road	3	Stony Creek	Town line	south 1.1 miles	1.10	Restoration (overlay)	\$ 116,000.00	8
Glen Athol Road	13	Thurman	Parker Cross	north .85 miles	0.85	Reconstruct/Resurface	\$ 217,000.00	19
Friend's Lake Road	8	Chester	2016 Construction	north .80 miles	0.80	Reconstruct / Resurface	\$ 203,210.00	18
Dartmouth Road	76	Stony Creek	2016 Murray Rd rebate	northeast .60 miles	0.60	Reconstruct / Resurface	\$ 173,138.00	13
CHIPS & Pave NY TOTAL							\$ 2,024,348.00	156
Additional County Funding								
Main Street North Creek	77	Johnsburg	Rt 28	Rt 28N	1.00	Reconstruct / Resurface	\$ 502,000.00	22
Valley Woods Road	11	Bolton	2016 Construction	Finkle Rd	0.90	Restoration (overlay)	\$ 89,842.00	6
SUB TOTAL							\$ 591,842.00	28
Total							\$ 2,616,190.00	184